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December 14, 2017

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## Recommended Citation

Davies, Ruxandra and Lewis, Justin, "MECHANISM FOR QUEUING LIVESTREAM CONTENT IN A MEDIA CONTENT DISPLAY QUEUE", Technical Disclosure Commons, (December 14, 2017)  
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## **MECHANISM FOR QUEUING LIVESTREAM CONTENT IN A MEDIA CONTENT DISPLAY QUEUE**

A content item service may provide content items (e.g., videos, songs, audiobooks, etc.) to users. For example, the content items may be streamed or otherwise provided or rendered to the users. A user of the content item service may place multiple content items into a queue, also known as a playlist, where the content items may be sequentially provided to the user (automatically one after another) based on the order of the queue. Some of the content items provided by the content item service may be previously recorded and provided to the user as content on demand. For example, if a video has been previously recorded, the user may send a request to view the video to the content item service and, in response, the content item service may provide the video to the user for viewing. Other content items provided by the content item service may be live content that is constantly received by and presented to the user (e.g., a livestream) while being delivered by a content provider. For example, a livestream broadcast of a sporting event may be presented to a user in substantially real-time. Alternatively, a live content item may be a previously recorded content item that is being presented for the first time. For example, a TV episode that has been previously recorded but is being aired for the first time may be considered a live content item. A playlist may include both previously recorded content items and live content items. For example, the playlist may have a previously recorded content item as the first content item to be provided, followed by a live content item, followed by another previously recorded content item. The playlist may be arranged in any number of orders and configurations by the user or the content item service.

A livestream may begin at a designated start time and end at a particular time. For example, the livestream may have a starting time of 1 PM and end at 3 PM. In order to pass the

time before and/or after the live content item, a user may watch other content items by adding them to the playlist. For example, while waiting for the livestream to start, a user may add an episode of a TV show to the queue before the livestream so that the TV show may be played. Alternatively, the content item service may generate the playlist for the user. However, while watching the TV episode, a user may need to pay attention to the time to ensure that they do not miss the start of the livestream. Additionally, once the start time of the livestream is reached, a user may have to stop playing the content item currently being viewed in order to begin watching the livestream. For example, if the user is watching the TV episode and is half way through when the livestream begins, the user may have to decide between finishing the TV episode and missing the beginning of the livestream, or switching to the livestream and not finishing the TV episode. Furthermore, even if the user begins watching the live stream at the proper time, the user may miss content if the live stream starts early or, conversely, may watch content they are not interested in if the desired livestream starts late. For example, if the livestream starts prior to its 1 PM start time, then the user may miss the beginning of the livestream. If the livestream is delayed, the user may watch whatever content is playing prior to the start of the livestream. Thus, it is very difficult for live broadcasts to be included in a playlist.

We propose a mechanism to queue live content items in a playlist by including timestamps corresponding to a start time and end time of a content item. Each item of live content added to a playlist may include both an absolute timestamp and a relative timestamp. The absolute timestamp may correspond to a start and/or end time of a live content item in real time. For example, if a livestream is scheduled to begin at 1 PM and end at 3 PM, then when the livestream is added to the playlist it may include absolute timestamps indicating that the livestream is to begin at 1 PM and end at 3 PM. The relative timestamp may correspond to the

start time and/or end time of a live content item relative to the playlist. For example, if a user begins playing a playlist at 11 AM and the livestream begins at 1 PM, then the relative timestamp may indicate that the livestream begins 2 hours into the playlist. In another example, if a user begins watching the playlist at 10 AM and the livestream begins at 1 PM, then the relative timestamp may indicate that the livestream begins 3 hours into the playlist.

By including absolute and/or relative timestamps with a livestream when it is added to a playlist, the playlist may be dynamically modified based on the user reaching the livestream too early or too late. In the event that a user reaches the livestream too early, the playlist may provide a prompt to the user through a user interface (UI) that the livestream has not yet started. The UI may include various selectable icons that correspond to actions that may be performed. An action may be moving a content item in the playlist that was scheduled to play after the livestream so that it now plays before the livestream. For example, if a user begins watching a livestream channel five minutes before the livestream begins, then the content item service may begin playing the next content item in the playlist while the user is waiting for the livestream to begin. In some implementations, the content item service may determine which content item to play based on the amount of time remaining until the livestream begins. For example, if the livestream begins in five minutes, then the content item service may select a content item from the playlist that is approximately five minutes in length to play before the livestream. If a user does not desire a new content item to be played, the user may select an action from the UI that allows the user to stay on the livestream channel.

In the event that a user may be late to a livestream, the content item service may provide a prompt to the user through a UI indicating that the livestream is starting soon and asking if the user would like to switch to the livestream. The user may select various icons or text from the UI

that correspond to particular actions, such as switching to the livestream or continue viewing the current content item. For example, if the user selects switching to the livestream while viewing a TV episode, then the TV episode may pause and the user may begin viewing the livestream. In some implementations, the TV episode may be moved after the livestream in the playlist so that the TV episode may be resumed upon the conclusion of the livestream.

In another example, if the user selects continuing to view the current content item, then the content item service may begin recording the livestream to a data store, such as in a DVR, server or cloud, to be provided as content on demand to the user at a later time. For example, if the user selects continuing to view a TV episode, then the livestream may begin recording and will be provided to the user once the TV episode has completed. In some implementations, a livestream may automatically be recorded to a data store in response to being added to a playlist, being favorited, being shared to another user or the like.

This mechanism may also provide information necessary to pre-cache livestream content on a local client device of a user. For example, if a user is watching a TV episode that ends in 20 seconds and the next content item on the playlist is a livestream, the content item service may begin downloading a portion of the livestream on the user's device to be provided once the TV episode has concluded. Furthermore, ad-skipping features may be incorporated to livestream recordings on the data store. For example, the content item service may detect ads or commercials in the recorded livestream and skip them automatically.

Figure 1 depicts a flow diagram of a method to queue a livestream in a playlist of content to be provided to a user, according to an implementation. First, at step 101, a livestream including at least one timestamp may be added to a playlist. For example, the livestream may be added to the playlist and include an absolute timestamp that indicates the livestream starts at 1

PM. In some implementations, the livestream may include multiple timestamps indicating a start time and end time for the livestream. In other implementations, the livestream may include a relative timestamp that indicates when the livestream will start relative to the playlist.

Next, at step 102, content items are sequentially provided to a user by the content item service based on the playlist. Content items of the playlist may be dynamically adjusted based on different parameters, such as the start time of the livestream. For example, if the user reaches the livestream on the playlist before the start time indicated by a timestamp, a content item may be moved in front of the livestream on the playlist and provided to the user. In some implementations, the content item service may determine which content item to play based on the amount of time remaining until the livestream begins. For example, if the livestream begins in five minutes, then the content item service may select a content item from the playlist that is approximately five minutes in length to play before the livestream.

Subsequently, at step 103, the content item service may determine a user is late to the livestream on the playlist based on the timestamp. For example, if a user is watching a TV episode and the livestream is about to begin in 15 seconds, the content item service may determine that the user may be late to view the livestream. At step 104, the content item service may generate a notification to be presented to the user in a UI that indicates the livestream is about to begin. The notification may include several selectable icons or texts that correspond to actions that may be performed with regard to the content items. For example, if a user is watching a TV episode and they receive a notification indicating the livestream is about to begin, the user may decide they wish to finish watching the TV episode before tuning into the livestream and may select the icon that corresponds to this action.

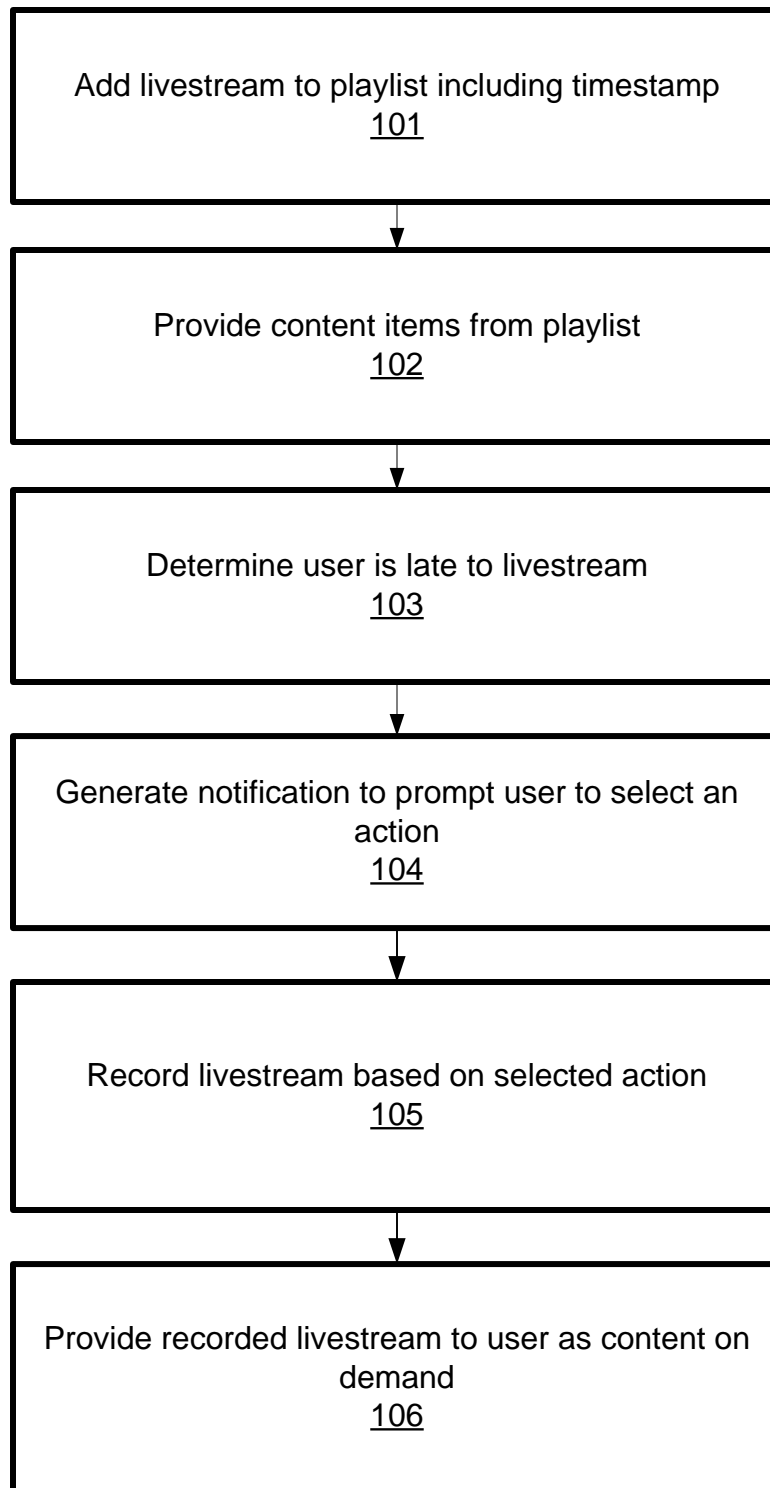
Furthermore, at step 105, if a user decides to not begin watching the livestream at step 104, the content item service may record the livestream on a data store. For example, if the user decides they would like to continue watching the TV episode rather than tune into the livestream, the content item service may begin to record the livestream on the user's DVR. At step 106, the content item service may provide the recorded livestream to the user as content on demand. For example, the content item service may provide the recorded livestream to the user once the TV episode they were watching has completed.

## ABSTRACT

A mechanism is provided to queue live content items in a playlist by including timestamps corresponding to a start time and end time of a content item. A livestream may be added to a playlist that includes a timestamp and content items from the playlist may be provided to a user. Subsequently, a content item service may determine a user may not reach a livestream on time. The content item service may generate a notification to be presented to the user in a user interface that includes selectable icons representing actions that may be performed on the content items. In response to a user selection, the content item service may begin recording the livestream. At a later time, the recorded livestream may be presented to the user as content on demand.

**Keywords:** livestream, playlist, content, streaming, queue, timestamp





**FIG. 1**